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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: 't Hooft et al.

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For: FOOD COMPOSITION SUITABLE FOR SHALLOW FRYING COMPRISING SUNFLOWER LECITHIN

Edgewater, New Jersey 07020
April 1, 2002

SUBMISSION OF PRIORITY DOCUMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to rule 55(b) of the Rules of Practice in Patent Cases, Applicant(s) is/are submitting herewith a certified copy of the European Application No. 00204763.7 filed December 21, 2000, upon which the claim for priority under 35 U.S.C. § 119 was made in the United States.

It is respectfully requested that the priority document be made part of the file history.

Respectfully submitted,

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Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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Der Präsident des Europäischen Patentamts;
Im Auftrag

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Food composition suitable for shallow frying comprising sunflower lecithin

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Food composition suitable for shallow frying comprising sunflower lecithin

Field of the invention

The invention relates to food compositions suitable for shallow frying. The invention further relates to a process for hydrolysis of native lecithin, resulting in a product suitable for addition to food compositions suitable for shallow frying.

Background of the invention

Food compositions suitable for shallow frying are well known. Examples of such food compositions are butter, margarine, including liquid margarine, spreads, such as low fat spread and cooking milk. The food compositions are often multifunctional, i.e. they can be used for different purposes, e.g. baking and spreading on bread, next to suitability in frying.

When used in shallow frying, the spattering performance of the food compositions is important. Spattering during shallow frying should be avoided as much as possible.

Lecithin is well known to have an anti-spattering effect. The improvement of spattering performance is therefore an important reason for incorporation of lecithin in food compositions.

Lecithin is a widely used term for a complex mixture of phosphatides produced from a variety of vegetable and animal sources. Examples of the phosphatides are phosphatidyl choline (PC), phosphatidyletanolamine (PE)and phosphatidylinositol (PI)

and phosphatidic acid (PA). Hydrolyzed phosphatides are designated by the prefix lyso-, for instance lyso-PC or LPC.

Vegetable lecithins are derived from crude vegetable oils or fats, in which the lecithins are present as a colloidal solution. They are usually removed in a degumming step in which lecithin is precipitated, e.g. by injection of steam into the oil or fat or by injection of water or an aqueous solution.

The lecithins are available in the market as a very viscous substance containing 60-65 wt.% phosphatides, 30-35 wt.% oil and about 5% of other compounds, e.g. sterol. Such mixture is herein referred to as native lecithin.

Lecithins are usually designated depending of their origin. e.g. soybean lecithin, sunflower lecithin, rapeseed lecithin, canola lecithin, cotton seed lecithin, egg lecithin, etc.

By far the most important native lecithin is soybean lecithin, which is derived from soya bean oil. Next to native soybean lecithin, also de-oiled soybean lecithin (from which the oil fraction has been removed) and hydrolyzed soybean lecithin are known and commercially available.

Due to the large predominance of soybean lecithin relative to the other lecithins, the skilled person generally uses the expression lecithin when actually soybean lecithin is meant.

The use of lecithin as anti-spattering agent in a food composition is for instance illustrated in EP-B-265 003, which discloses a food composition with reduced fat content, wherein the fat phase has up to 75 wt.% fat. The emulsion comprises an

emulsifier system with a mixture of phospholipids containing phospholipids containing phosphatidyl choline and phosphatidyl ethanolamine in a ratio exceeding 3:1. The lecithin emulsifier system is prepared by extracting soybean lecithin with a polar extraction solvent, for instance an alcohol.

According to US-3,505,074 the emulsifying properties of phosphatides, for example as anti-spattering agent in margarine is improved by partial hydrolysis of the phosphatides.

EP-B-253 429 discloses a surface-active composition, which comprises at least 3% lysophosphatidylethanolamine and wherein the degree of hydrolysis of phosphatidylethanolamine and the degree of hydrolysis of phosphatidylcholine is higher than 1.5. The surface-active composition, which is reported to give improved spattering performance, is prepared in a process, which involves fractionation and subsequent hydrolysis.

Although the phosphatide compositions prepared according to the above prior art show good spattering performance, they have the disadvantage that they involve in their preparation additional process steps like fractionation and hydrolysis. A process step involving hydrolysis further has the potential disadvantage to increase the level of foaming of food compositions comprising the hydrolyzed lecithin. Therefore the use of native soybean lecithin is still very common in frying compositions.

We have found that although the spattering performance of native soybean lecithin may be sufficient in food compositions comprising 80 wt.% of a fatty phase, it is insufficient when food composition are prepared having a lower fat content, e.g. 70 wt.% fat, 60 wt.% fat or below.

J. Hollo et al., JAOCS, Vol. 70, no. 10 (1993), 997-1001 discusses the fractionation, acylation and enzymatic hydrolysis of sunflower lecithin and its possibilities for utilization. The hydrolysis time reported is 1 to 5 hours. No description of use of sunflower lecithin in food compositions is given.

S. Zmarlicki , Prezemysl-Spozywczy,53 (11), 63-65 describes that a series of 23 protein-free dairy spreads were produced having 0.4% sunflower lecithin as emulsifier. The spreads were produced using 40-80% anhydrous milk-fat, 0-30% sunflower oil (0-42.8% in the fat phase) and 0.02-0.04% commercial butter flavouring and had good taste and flavour properties. The spreads have a high animal fat content and the spattering performance in shallow frying is not mentioned.

Summary of the invention

An object for the invention is to improve the spattering performance of the prior art food compositions, when used in shallow frying.

A further object of the invention is to provide a food composition that has improved properties related to both spattering performance and foaming.

Another object of the invention is to provide a food composition having health benefits, for instance a lowering effect on the level of blood cholesterol in humans.

Yet another object of the invention is to provide a food composition that can be prepared from natural occurring ingredients with less process steps involved.

One or more of these objects are attained according to the invention providing a food composition, comprising triglycerides, wherein least 70 wt.% of triglycerides is of vegetable origin, and 0.05-3 wt.% sunflower lecithin.

One or more of the objects is further attained by a food composition, suitable for shallow frying comprising 0.05-3 wt.% sunflower lecithin, wherein the sunflower lecithin is hydrolyzed or fractionated.

Hydrolyzed sunflower lecithin is herein understood to be sunflower lecithin, wherein the degree of hydrolyzation as defined in the examples is 0.05 or higher.

The invention further provides an improved process for the hydrolysis of lecithin, in which the hydrolysis time is reduced, wherein sunflower oil is subjected to a de-gumming operation to give native sunflower lecithin, wherein the native sunflower lecithin is subjected to hydrolysis, characterized that the reaction time during hydrolysis is 0.1-3 hour.

Detailed description of the invention

The following definitions will be used throughout the description and claims. Where ranges are mentioned, the expression from a to b is meant to indicate from and including a, up to and including b, unless indicated otherwise. The term's 'oil' and 'fat' are used interchangeably.

The food compositions according to the invention may be water-in-oil emulsions, for instance spreads or margarines, oil-in-water emulsions suitable for shallow frying, such as for instance cooking milk or may substantially consist of fat or oil.

The amounts of the oil and water phase in the product are not critical. For instance the food composition may comprise 30-100 wt.% fat phase and 0-70 wt.% aqueous phase. Preferably the food composition comprises 40-100 wt.% fat phase and 0-60 wt.% aqueous phase. More preferably the food composition is an oil in water emulsion comprising 60-90 wt.% fat phase and 10-40 wt.% aqueous phase.

A fat phase content of around 80 wt.% is common for margarines, as well as around 70 or 60%. The invention also relates to products that have a practically 100% fat phase: Though in these food compositions primary spattering as hereunder defined may not be important, secondary spattering is improved.

The food composition according to the invention may be a liquid margarine. A liquid margarine is herein defined as a water-in-oil emulsion comprising generally from 1-40, preferably 5 to 30 wt.% water, based on total composition weight.

The fat phase may comprise any triglyceride oil, as long as at least 70 wt.% of triglycerides is of vegetable origin. A fat phase rich in triglycerides comprising (poly) unsaturated fatty acid residues is highly preferred. Therefore the fat is preferably selected from the group comprising sunflower oil, soybean oil, rapeseed oil, cottonseed oil, olive oil, corn oil,

groundnut oil, maize oil, Linola oil, linseed oil, coconut oil, palmkernel oil and/or combinations thereof. These fats may be partially hydrogenated. The fat phase may comprise sucrose polyesters which are used as fat replacers, or may contain functional ingredients, such as sterols or stanols, or esters thereof.

An amount of fat of animal origin, for instance butter fat may be advantageous, e.g. for taste, however, the total of these fats should be below 30 wt.% of total triglycerides in the food composition.

Optionally the food composition comprises in addition to these fats a hard fat component selected from the group comprising: hardened rapeseed oil, hardened soybean oil, hardened rapeseed oil, hardened cottonseed oil, hardened corn oil, hardened groundnut oil, palmoil, hardened palmoil, palmoil fractions, hardened palmoil fractions, butterfat or butterfat fractions. These fats are optionally partly or fully hydrogenated and/or interestified to obtain the desired structuring properties. This hard fat may partly serve to impart structure and or stability to the products.

The fat phase may comprise ingredients which are common in frying products, such as colorant, e.g. carotene, fat soluble flavours and vitamins, mono- and/or diglycerides, etc.

The optional aqueous phase of the food composition may comprise ingredients which are common in frying products, such as proteins, flavours which are water soluble, emulsifiers, thickeners, salt, dairy ingredients, preservatives etc.

The food compositions according to the invention may be packaged in usual manner. Margarines may be packed in a wrapper, tub or in a bottle. Other food products may be packed in bottles, tins, foil, paper, etc. or sold as such.

The sunflower lecithin may be hydrolyzed or fractionated. Hydrolysis may be executed in a known manner, e.g. in an enzymatic process with phospholipase. However the reaction time may be shorter than a reaction time usual for soybean lecithin.

Preferably the sunflower lecithin is hydrolyzed and the degree of hydrolysis of the sunflower lecithin is 0.2 to 0.4, more preferably 0.3 to 0.36.

The invention further relates to a process for the preparation of hydrolyzed sunflower lecithin, wherein sunflower oil is subjected to a de-gumming operation to give native sunflower lecithin, wherein the native sunflower lecithin is subjected to hydrolysis, characterized that the reaction time during hydrolysis is 0.1-3 hour.

Preferably the reaction time during hydrolysis is such that the degree of hydrolysis of the hydrolyzed sunflower lecithin is 0.2 to 0.4, more preferably from 0.3 to 0.36.

Under these conditions an improved spattering performance of food products with the hydrolysed sunflower lecithin is obtained.

Preferably the hydrolysis process is conducted using an enzymatic process using phospholipase A-2 enzyme.

The sunflower lecithin may also be fractionated, e.g. by extraction with an alcohol, for instance ethanol.

Food products according to the invention show reduced spattering upon preferred use as shallow frying product. Shallow frying products are defined as products used for shallow frying, i.e. frying wherein the food product to be fried is fried in a thin layer of frying product, i.e. the product is not completely immersed in the frying product. An example of shallow frying is frying of meat, fish or vegetables in a pan. On the contrary, in deep frying, the food product to be fried is usually completely immersed in the frying product. An example of deep frying is the frying of potato chips in a deep oil filled frying pan.

During shallow frying with a frying product comprising an aqueous phase, such as margarine, generally spattering will occur in two instances, separated in time. A first type of spattering, generally referred to as primary spattering may occur when the margarine is heated in the frying pan. Primary spattering is a result of explosion-like evaporation of superheated water droplets, originating from the aqueous phase of the margarine. A second type of spattering occurs, when water, or a food product that releases water, such as meat, fish or vegetable is introduced into the heated frying product. This type of spattering, again due to explosive evaporation of superheated water, is called secondary spattering.

Values for primary spattering (SV1) and secondary spattering (SV2) are herein determined according to the method illustrated in the examples.

The invention is now illustrated by the following, non-limiting examples

Examples

Determination of spattering value in a spattering test

Primary spattering (SV1) was assessed under standardised conditions in which an aliquot of a food product was heated in a glass dish and the amount of fat spattered onto a sheet of paper held above the dish was assessed after the water content of the food product had been evaporated by heating.

Secondary spattering (SV2) was assessed under standardised conditions in which the amount of fat spattered onto a sheet of paper held above the dish is assessed after injection of a quantity of 10 ml water into the dish.

In assessment of both primary and secondary spattering value, 25 g food product was heated in a 15 cm diameter glass dish on an electric plate to about 205 °C. The fat that spattered out of the pan by force of expanding evaporating water droplets was caught on a sheet of paper situated at 25 cm above the pan (SV1 test). Subsequently a quantity of 10 ml water was injected into the dish and again the fat that spattered out of the pan by force of expanding evaporating water droplets was caught on a sheet of paper situated above the pan (SV2 test).

The images obtained were compared with a set of standard pictures number 0-10 whereby the number of the best resembling picture was recorded as the spattering value. 10 indicates no

spattering and zero indicates very bad spattering. The general indication is as follows.

Score	*Comments*
10	Excellent
8	Good
6	Passable
4	Unsatisfactory for SV1, almost passable for SV2
2	very poor

Typical results for household margarines (80 wt.% fat) are 8.5 for primary spattering (SV1) and 4.6 for secondary spattering (SV2) under the conditions of the above mentioned test.

Example 1

Hydrolysis of sunflower lecithin

In a 1 liter stainless steel vessel, equipped with an Ultra turrax stirrer and placed in a waterbath (Lauda), heated at 50 degrees C, 420 g sunflower lecithin in 272 g demineralized water was prepared. The mixture was stirred until a watercontinuous mixture was obtained and then the pH was adjusted to 7.0 with 25% ammonia solution.

To the mixture 42 ml demineralized water and 0.035 ml enzyme solution Lecithase (Novo Nordisk Co., Denmark) were added. The resulting sludge was heated to 50 degrees C and stirred at 70 rpm.

The hydrolysis of lecithin was followed by taking samples from the sludge and measuring the degree of hydrolysis. The results are given in table 1.

Table 1: Results of hydrolysis of sunflower lecithin

Reaction time (min.)	0	30	60	90	120
Degree of hydrolysis	0.03	0.26	0.33	0.47	0.46
SV 1	8	7.75	8	7.75	7.75
SV 2	7	6.75	7.5	7	7

The degree of hydrolysis was defined as the ratio between lyso-PE and (lyso-PE + PE). Phosphatide amounts herein are determined by 31P-NMR (nuclear magnetic resonance)analysis. SV1 and SV2 were determined in a food composition prepared according to example 2.

Example 1 shows that an optimum spattering performance for sunflower lecithin is reached at a hydrolysis time of 60 minutes. This is a very short hydrolysis time compared to the hydrolysis of soybean lecithin, where hydrolysis times of 10-12 hours are needed under conditions of example 1.

Example 2

Preparation food composition

A food composition with the following composition was prepared:

80 wt.% fat blend (fats solids profile: N_{10}=35, N_{20}=20.0, N_{30}=8.5 and N_{40}=0), 0.48 wt. % lecithin, 0.04 wt. % saturated monoglyceride (Hymono 8903), 0.96 wt. % salt, 1.06 wt.% sour whey powder and 17.46 wt.% tap water. The pH of the mixture was adjusted at 4.6 with 10% citric acid.

A pre-mix of the ingredients was passed through a Votator line with 3 scraped surface heat exchangers (A-units) one stirred crystallizer (C-unit) and a resting tube (B-unit) in a A-A-C-A-B sequence, the A units and C unit were operated at 500 rpm. The food composition leaving the B-unit had a temperature of 11 degrees C and was packed in wrappers.

The lecithins designated as Bolec were obtained from Unimills, Zwijndrecht, Netherlands and having an acetone insoluble fraction of 62 wt.% (a measure indicative of total phospholipid content).

Native sunflower lecithin was obtained from Cereol Novenyollajipari RT, Magyarorszag, Budapest, Hungary, having an acetone insoluble fraction of 56.5 wt.%.

Hydrolyzed sunflower lecithin was obtained according to the procedure in example 1, with a reaction time of 60 minutes.

N-values of the fat blend may be determined by means of NMR, using the method described in "Fette, Seifen, Anstrichmittel" 80, (1978), 180-186.

The results of the spattering performance test are given in table 2.

Table 2: Spattering performance for 80 wt. % fat food composition

Spattering perf.	Native soybean lecitin (Bolec ZT)	Native sunflower lecithin	Hydrolyzed soybean lecithin (Bolec MT)	Hydrolyzed sunflower lecithin
SV1	8.75	8.0	8.0	8.0
SV2	5.5	7.0	7.25	7.5

Table 2 shows that the spattering performance SV 2 is improved. The spattering performance SV1 for native lecithins was comparable taking into account that the total phospholipid content of the soybean lecithin was about 10% higher (acetone insoluble fraction 62 instead of 56.5%).

Example 3

Preparation of a food composition

Example 2 was repeated, however with the following composition:

70 % fat blend (as in example 2), 0.4% lecithin, 0.05% saturated monoglyceride (Hymono 8903),0.7% salt, 0.3% sour whey powder, pH 4.6

The results of the spattering performance test are given in table 3.

Table 3: Spattering performance for 70 wt. % fat food composition

Spattering perf.	Native soybean lecitin (Bolec ZT)	Native sunflower lecithin	Hydrolyzed soybean lecithin (Bolec MT)	Hydrolyzed sunflower lecithin
SV1	7.25	7.0	7.0	7.0
SV2	6.0	6.75	6.25	7.5

Table 3 shows that the spattering performance SV 2 is improved. The spattering performance SV1 for native lecithins was comparable taking into account that the total phospholipid content of the soybean lecithin was about 10% higher (acetone insoluble fraction 62 instead of 56.5%).

Claims

1. Food composition, suitable for shallow frying, comprising triglycerides, wherein least 60 wt.% of triglycerides is of vegetable origin, and 0.05-3 wt.% sunflower lecithin.

2. Food composition, suitable for shallow frying comprising 0.05-3 wt.% sunflower lecithin, wherein the sunflower lecithin is hydrolyzed or fractionated.

3. Food composition according to claim 2, wherein the sunflower lecithin is hydrolyzed and the degree of hydrolysis of the sunflower lecithin is 0.2 to 0.4.

4. Food product according to claim 3, wherein the degree of hydrolysis of the sunflower lecithin is 0.3 to 0.36.

5. Food composition according to any of claims 1-4, wherein the food composition comprises:
   a) 30-100 wt.% fat phase
   b) 0-70 wt.% aqueous phase.

6. Food composition according to claim 5, wherein the food composition comprises:
   a) 40-100 wt.% fat phase
   b) 0-60 wt.% aqueous phase.

7. Food composition according to claim 6, wherein the food composition is an oil in water emulsion comprising:
   c) 60-90 wt.% fat phase
   d) 10-40 wt.% aqueous phase.

8. Process for the preparation of hydrolyzed sunflower lecithin, wherein sunflower oil is subjected to a de-gumming operation to give native sunflower lecithin, wherein the native sunflower lecithin is subjected to hydrolysis, characterized that the reaction time during hydrolysis is 0.1-3 hour.

9. Process according to claim 8, wherein the reaction time during hydrolysis is such that the degree of hydrolysis of the hydrolyzed sunflower lecithin is 0.2 to 0.4.

10. Process according to claim 9, wherein the reaction time during hydrolysis is such that the degree of hydrolysis of the hydrolyzed sunflower lecithin is 0.3 to 0.36.

11. Process according to claim 9 or 10, wherein the hydrolysis is conducted using an enzymatic process using phospholipase A-2 enzyme.

Abstract

The invention concerns a food composition, suitable for shallow frying, comprising triglycerides, wherein least 60 wt.% of triglycerides is of vegetable origin, and 0.05-3 wt.% sunflower lecithin. The invention further concerns a process for the preparation of hydrolyzed sunflower lecithin.